

# Progress in Estimating Climate Change Impacts

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# Overview

- Systematic assessment of potential impacts of climate change and valuation of damages goes back to 1970s\*
- Recent advances in process-based and statistical modeling
- Limited progress is accounting for adaptation capacity and human responses in general
- Emerging issue: need an integrated approach to impact/adaptation/development

\*for example, Williams, J. (ed.): 1978, *Proceedings of an IIASA Workshop on Carbon Dioxide, Climate, and Society*, Pergamon Press, Oxford, February 21–24

# Progress in physical exposure and impact modeling

- GCM resolution improves, downscaling, RCMs (e.g., watershed-scale, coral reef studies)
- Statistical modeling of responses (to variability): agriculture, migration, conflict
- Deployment of GIS data (coastal impacts)

# Where progress has been slow

- Incorporating adaptation capacity into impact modeling (arises in social and natural systems): obscure
- Understanding the gap between capacity and implementation of adaptation
- Assessing indirect effects
- Developing a comprehensive approach: development paths plus top-down/bottom-up

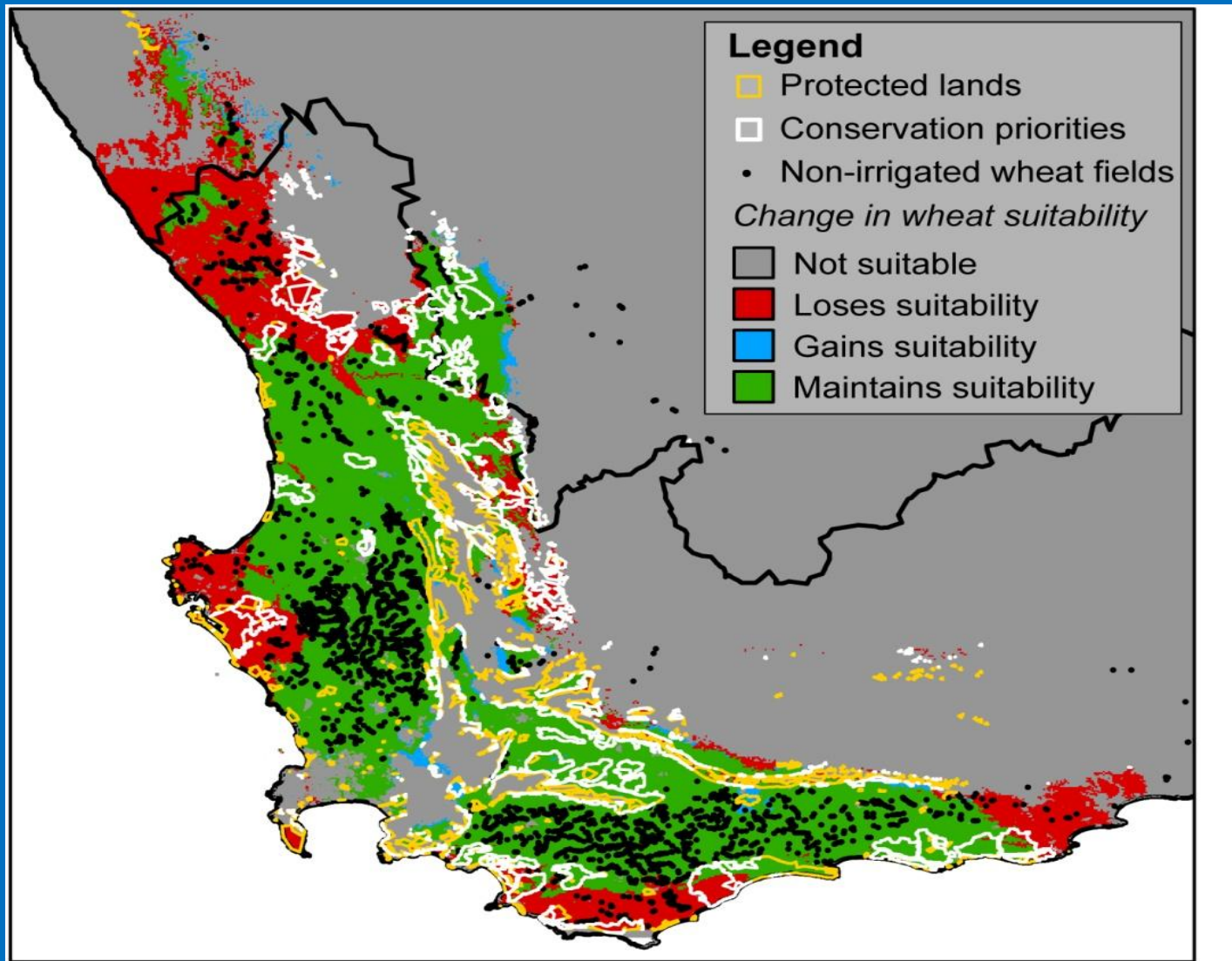
# Emerging areas

Human Responses to Climate Change and  
their

Indirect and Remote Consequences

>>> Migration of human population affects resources  
and people at a distance (Leman abstract)

>>> Shift in regions exploited for agriculture  
threatens or benefits unique ecosystems/species



Overlap of areas losing crop suitability and  
conservation land in Cape region, year 2050

Turner et al, Cons. Letters

# Integration of Impacts, Adaptation with Mitigation

- >>> Bio-fuel feedstock production impacts on land use for biodiversity, food production and prices (Schlenker abstract) and various reverberations, including political
- >>> Impacts of geo-engineering

# Interacting Systems and Stressors

- >>>Urbanization with urban heat islands and climate change (McCarthy et al 2010): affects energy and resource use and human health
- >>>Upstream water diversion causing deltaic subsidence with exposure to sea level rise (Ericson et al)



# Deltas and Upstream Reservoirs Worldwide

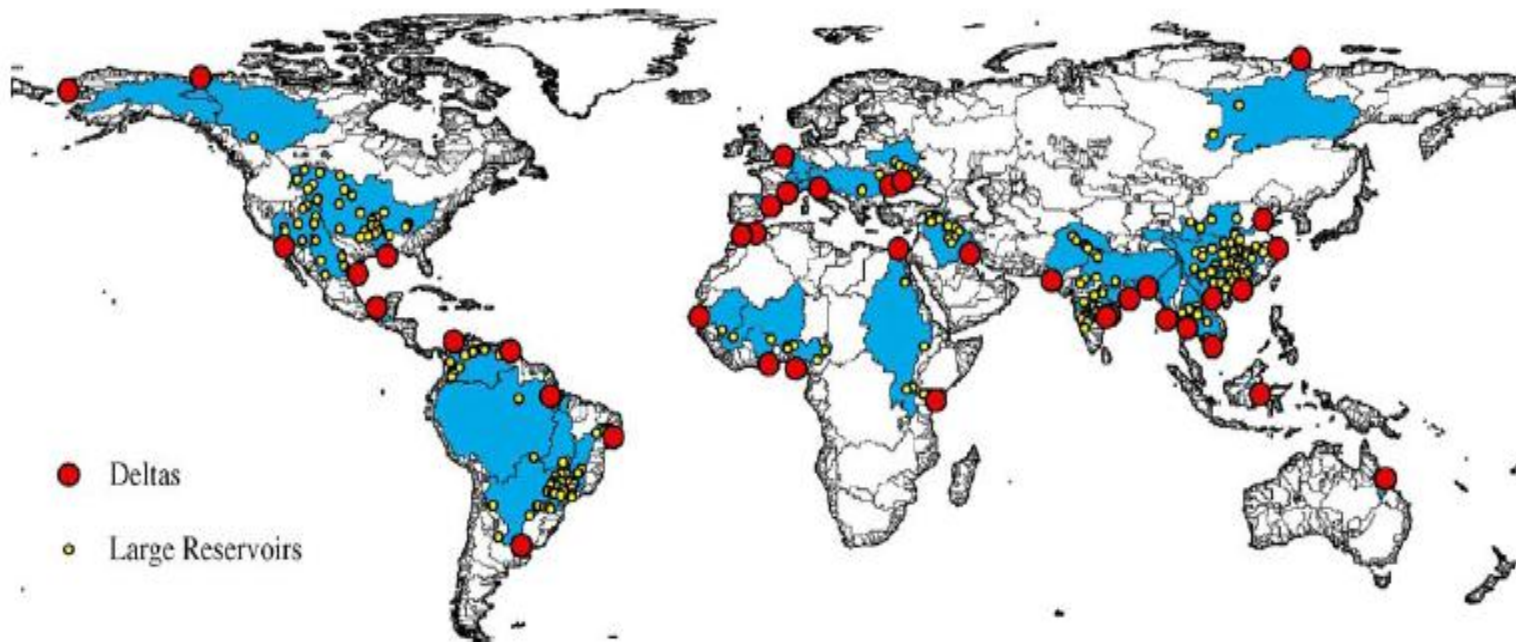


Fig. 1. Global distribution of the 40 deltas analyzed in this study, the potentially contributing drainage basin area of each delta (blue) and the large reservoirs ( $>0.5 \text{ km}^3$  maximum capacity) in each basin.

# Climate Extremes and Disasters

>>> Local specificity of exposure and vulnerability  
(Knutson abstract)

>>> How might learning occur as history becomes a  
poor  
guide to the future (SREX: lessons from disaster  
response)?

# Dynamic Vulnerability

- >>> Impacts depend on vulnerability, which evolves with development (e.g., affordability of coastal defense)
- >>> Both increases and decreases occur to vulnerability as learning competes with mal-adaptation and risk-shifting behavior (withdrawal vs. hardening in some cases of flood-plain defense)
- >>> How to integrate the contextual aspect associated with diverse potential development pathways into



Not just a developing country issue...  
welcome to Atlantic City



Courtesy Norm Psuty